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"In 62 years out of 70 there was one month in the growing season from April to August in which such a marked deficiency occurred as to cause a serious shortage of crop, and for the same period there were 39 years in which the deficiency extended throughout two months, while in 21 years it extended throughout three months, or in 30 per cent. of the years included in this record there were three months during the growing period in which the average rainfall was deficient one inch or more. It is thus observed that a wide series of crops would be likely to suffer in more than one-half of the years for which the record is available, while a still larger number would suffer in nearly one-third of the years, for it must be remembered that even a slight deficiency in one month may result in a serious reduction in yield and consequent loss, if it occurs at a time when the crop is making its largest development."

Some idea of the extent of the losses occasioned by such periods of drought may be gained from Professor Voorhees' estimate that the loss to the hay crop of New Jersey alone from the drought in May and early June, 1899, was \$1,500,000, while small fruits, vegetables, and other crops were also seriously affected.

"In 1897 and 1898, years of abundant rainfall in April and May, the yield of hay [at the Station] averaged 2.65 tons per acre. In 1899 it was a fraction over one ton, owing to the deficiency of rainfall in April and May—at the low price of \$10 per ton, a loss for the 25 acres of over \$400. The yield of crimson clover forage for 1897 and 1898 was 8.5 tons per acre; in 1899 the yield was but five tons, or in a good year the yield was 70 per cent. greater. The deficiency in the rainfall at the critical period was alone responsible for this difference in yield. . . . Oat and pea forage in 1897 and the early seeding of 1898 averaged six tons per acre; in 1899 the yield was but 3.3 tons."

In experiments at the Station with small fruits the increase in yield due to irrigation was as follows: Blackberries, 1,038 quarts per acre, worth \$93.42; raspberries, 329 quarts per acre, worth \$32.90; currants, 311 quarts per acre, worth \$31.10. The results of similar experiments in other parts of the State with a variety of crops confirmed those obtained at the Station. These results show beyond question that supple-

mental irrigation under such rainfall conditions as those noted above is a profitable undertaking, especially on fruits and garden crops. Since the rainfall conditions described may be considered typical of the whole eastern half of the United States, the conclusions reached regarding the profitability of irrigation are believed to be generally applicable to the agriculture of that region.

W. H. BEAL.

#### REMEASUREMENT OF THE PERUVIAN ARC.\*

In 1889 the question of the remeasurement of the Peruvian Arc was brought before the International Geodetic Association by the Delegate of the United States (Professor George Davidson, Assistant Coast and Geodetic Survey) who suggested that France should have a prior right to execute this work in consequence of the first measure having been made by her savants, members of the French Academy in 1736-43. Circumstances prevented any active work until 1898, when the discussion of the subject was renewed in the same Association as the result of a motion offered by the Delegate of the United States (Mr. E. D. Preston, Assistant Coast and Geodetic Survey).

The Association voted in favor of the proposition to remeasure the Arc and the French Delegates undertook to bring the matter to the attention of their government and to have an examination made, so that they could report to the next meeting of the Association at Paris during the present year.

Captains Maurain and Lacombe of the Geographic Service of the French Army left Paris in May, 1899, and remained in

\* The information is derived from the *Comptes Rendus, hebdomadaires des Seances de l'Académie des Sciences*, No. 26, June 25, 1900 (page 1740), and the *Bulletin de la Société de Géographie*, No. 7, July 15, 1900 (page 1).

Ecuador from July to November of the same year, successfully accomplishing in this time the reconnoissance for the new work.

Unfortunately all the marks left in the old work have been destroyed, even the base monuments having been demolished. According to the plan proposed the Arc of Quito which will replace the Arc of Peru covers 6° of latitude nearly double the length of the old Arc.

Fifty-two triangulation stations will be occupied. Three fundamental astronomical stations have been selected, one near Quito and one at each extremity of the Arc, where latitude and longitude will be determined. Other determinations of latitude will be made at intermediate stations to permit a study of the deviation of the vertical. Three base lines from eight to nine kilometers in length will be measured.

One is situated near Riobamba about the middle of arc and is to be connected with sea level by levels of precision which are expected to determine its elevation with an error not exceeding a few centimeters. Two verification base lines will be measured, one near each end of the Arc. Observation of gravity and magnetism will be made, and studies of topography, geology and other subjects of natural science undertaken. Quito possesses an observatory with modern instruments, in charge of a French astronomer, situated only fourteen minutes of latitude south of the equator, at an elevation of 3,000 meters above sea level.

To execute the measure of the new equatorial arc and complete the complementary studies that should be made in connection with it, it is estimated that five geodesists should devote four years of uninterrupted labor to this work. The difficulties to be overcome will tax the courage and scientific devotion of those upon whom the honor of its execution may be bestowed.

I. W.

#### SIXTH ANNUAL MEETING OF THE BOTANICAL SOCIETY OF AMERICA.

THE sixth annual meeting of the Botanical Society of America was held in New York City, June 26 to 28, 1900. For the reading of papers the Society met in joint session with Section G of the American Association for the Advancement of Science, June 28th, in Room 502, Schermerhorn Hall, Columbia University. The meeting of Section G was called to order by the Vice-President, Wm. Trelease, who announced the arrangements for the joint session and called B. L. Robinson, president of the Society, to the chair. The retiring president, L. M. Underwood, then read his address—'The Last Quarter: A Reminiscence, and an Outlook.' The full text of the address has already been printed in SCIENCE.

Following is the program of papers presented :

- 'The Significance of Transpiration': C. R. BARNES.
- 'Relationship and Variability of the Adirondack Spruce': CHAS. PECK.
- 'Nuclear Studies on Pellia': B. M. DAVIS.
- 'On the Structure of the Stem of *Polytrichadelphus dendroides*': MRS. E. G. BRINTON.
- 'Observations on the group Yuccæ': WM. TRELEASE.
- 'Spermatogenesis in the Gymnosperms': J. M. COULTER.
- 'The Pollen Tube, and Division of the Generative Cell, in Pines,' by invitation of the Council: MISS M. C. FERGUSON.
- 'On the Homologies and Probable Origin of the Embryo-Sac': GEO. F. ATKINSON.
- 'Observations on Leisonia': CONWAY MACMILLAN.
- 'Thigmotropism of Roots': F. C. NEWCOMBE.
- 'Starch in Guard Cells': B. D. HALSTED.
- 'Coenogametes': B. M. DAVIS.
- 'The Development of the Archegonium, and Fertilization in the Hemlock Spruce,' by invitation of the Council: W. A. MURRILL.
- 'The Causes Operative in the Formation of Silage,' by invitation of the Council: H. L. RUSSELL and S. M. BABCOCK.
- 'A Closed Circuit Respiration Apparatus,' by invitation of the Council: H. L. RUSSELL and S. M. BABCOCK.